38AQS012,016
Air-Cooled Split System Heat Pump
50/60 Hz

Wiring Diagrams

Units Produced After December 1998

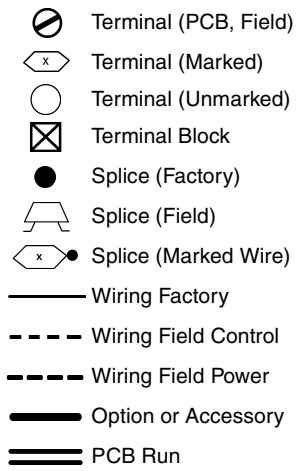
DIAGRAM INDEX

UNIT LABEL DIAGRAM				
Unit 38AQS	**V-Ph-Hz**	**Label Diagram No.**	**Schematic Figure**	**Component Arrangement Figure**
012,016	208/230-3-60	38AK502714	1	2
	230-5-50			
	400-3-50			
	460-3-60	38AK502724	3	4
	575-3-60			

38AQS Field Wiring Diagrams . . . . . Fig. 1-4
Motormaster® Control Diagrams . . . . . Fig. 5-12

LEGEND (Fig. 1 through 12)

AHA — Adjustable Heat Anticipator
C — Contactor
CAP — Capacitor
CB — Circuit Breaker
CC — Cooling Compensator
CH — Crankcase Heater
CLO — Compressor Lockout
COMP — Compressor
CR — Control Relay
CT — Current Transformer
CTD — Compressor Time Delay
DB — Defrost Board
DFB — Defrost Board
DFR — Defrost Relay
DFT — Defrost Thermostat
EQUIP — Equipment
FCPS — Fan Cycling Pressurestat
FLA — Full Load Amps
FU — Fuse
GND — Ground
HPS — High-Pressure Switch
HR — Heater Relay
IFC — Indoor-Fan Contactor
IP — Internal Protector
L — Light
LCS — Loss-of-Charge Switch
LLS — Liquid Line Solenoid
LOR — Lockout Relay
NDR — No-Dump Relay
NEC — National Electrical Code
OFC — Outdoor-Fan Contactor
OFM — Outdoor-Fan Motor
OFR — Outdoor-Fan Relay
OPS — Oil Pressure Switch
PCB — Printed Circuit Board
QT — Quadruple Terminal
R — Isolation Relay
RC — Cooling Connection (Thermostat)
RH — Heating Connection (Thermostat)
RVR — Reversing Valve Relay
RVS — Reversing Valve Solenoid
SOL — Solenoid
TB — Terminal Block Terminal
TC — Thermostat — Cooling
TH — Thermostat — Heating
TRAN — Transformer
U — Unloader
UR — Unloader Relay



NOTES

1. Compressor and fan motor(s) thermally protected. Three-phase motors are protected against primary single-phasing conditions.
2. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
3. Terminal block 2 (TB2) is for field external control connections, Class 2 wiring. Supply voltage at TB2 is 24 vac. Maximum power available at TB2 is 31.5 va.
4. Field-supplied component ratings: IFC sealed coil rating (24 vac) 12 va max.
5. Use thermostat HH07AT172 with subbase HH93AZ177.
6. Use copper, copper-clad aluminum, or aluminum conductors for field power supply only.
7. Insulate unused lead when changing tap for 208 volt use.
8. The CB must-trip amps are equal to or less than 140% FLA.
9. Set thermostat heat anticipator(s) for first stage .79; for second stage .63.
10. The CLO locks out the compressor to prevent short cycling on compressor overload and safety devices. Before replacing CLO, check these devices.
11. Remove jumper between RC and RH.
12. Defrost cycle time is factory set at 30 min.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

SEQUENCE OF OPERATION — 38AQS012,016 OUTDOOR UNIT

Assume the power is on and the thermostat is set at SYSTEM AUTO, FAN AUTO. and desired temperature.

Cooling — If power to unit has been off for an extended period of time, energize crankcase heater at least 24 hours prior to starting compressor.

The indoor fans, outdoor fans, and compressor start within 5 minutes (due to compressor time delay) on command from the controlling thermostat in either the Cooling or the Heating mode of operation. When first stage cooling is required, thermostat (TC1) closes, causing the heat pump to start with an unloaded compressor. When TC2 closes, demanding additional cooling, the compressor loads. In a system with a one-stage thermostat, the unit may be wired so the compressor starts fully loaded. The RVS (reversing valve solenoid) is deenergized during Cooling mode operation.

Heating

FIRST STAGE — When the thermostat (TH1) calls for heating, the indoor-fan motor, outdoor-fan motors, and the compressor (fully loaded) are energized. The RVS is energized in the Heating mode.

SECOND STAGE — If additional heating is required, TH2 on the thermostat closes, causing the auxiliary heat supply (i.e., electric resistance heat) to be energized in 1 or 2 stages depending on the number of stages available and whether the outdoor thermostats are closed.

Defrost Cycle — Defrost is initiated by a timer which may be set to 30, 50, or 90 minutes. The cycle begins when the defrost timer motor contacts close for 20 seconds. If the defrost thermostat is closed, the reversing valve and outdoor-air fans are deenergized. The unit operates on this modified Cooling mode to defrost the coil. The defrost cycle continues until the defrost thermostat or defrost high pressure switch opens or 10 minutes have elapsed.

When the unit is in the defrost cycle, electric resistance heat is energized to prevent cold air recirculation during this modified Cooling mode.

Air Circulation — When the fan switch is at FAN ON, the indoor-air fans operate continuously to provide ventilation. The thermostat operates the other components as described above.

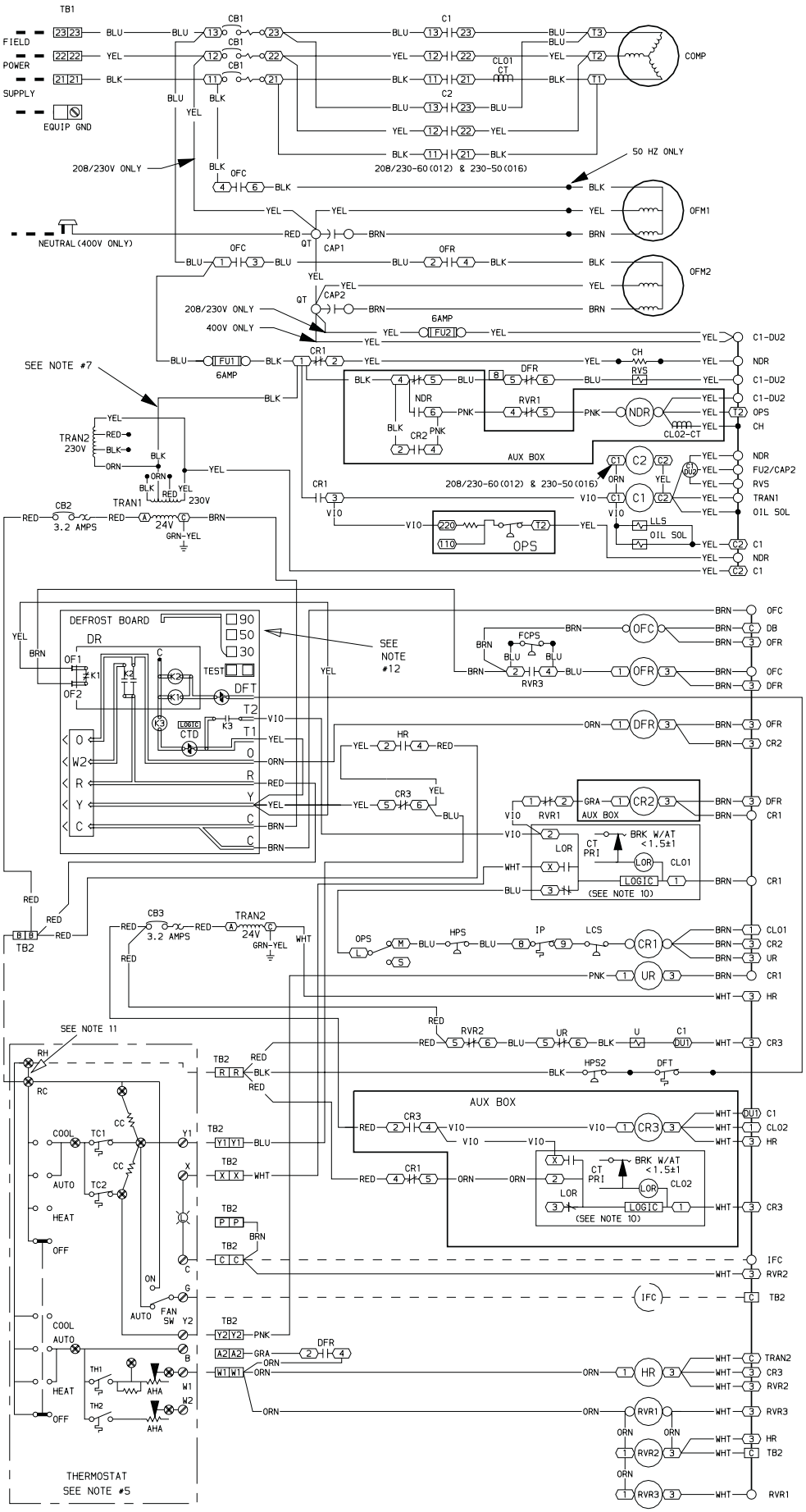


Fig. 1 — Schematic — 38AQS012,016; 208-230/3/60, 230/3/50 and 400/3/50 Units

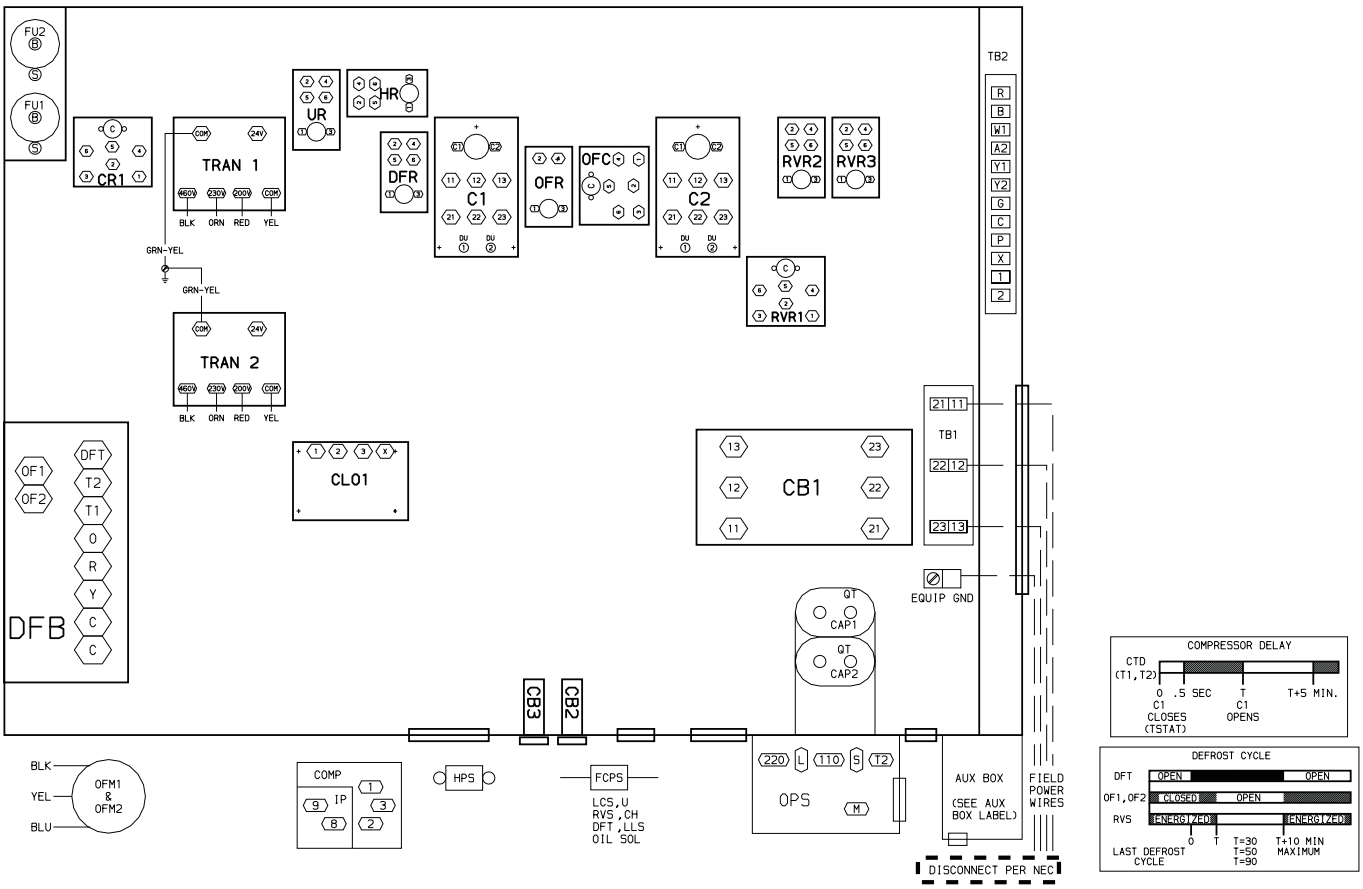


Fig. 2 — Component Arrangement — 38AQS012,016; 208-230/3/60, 230/3/50 and 400/3/50 Units

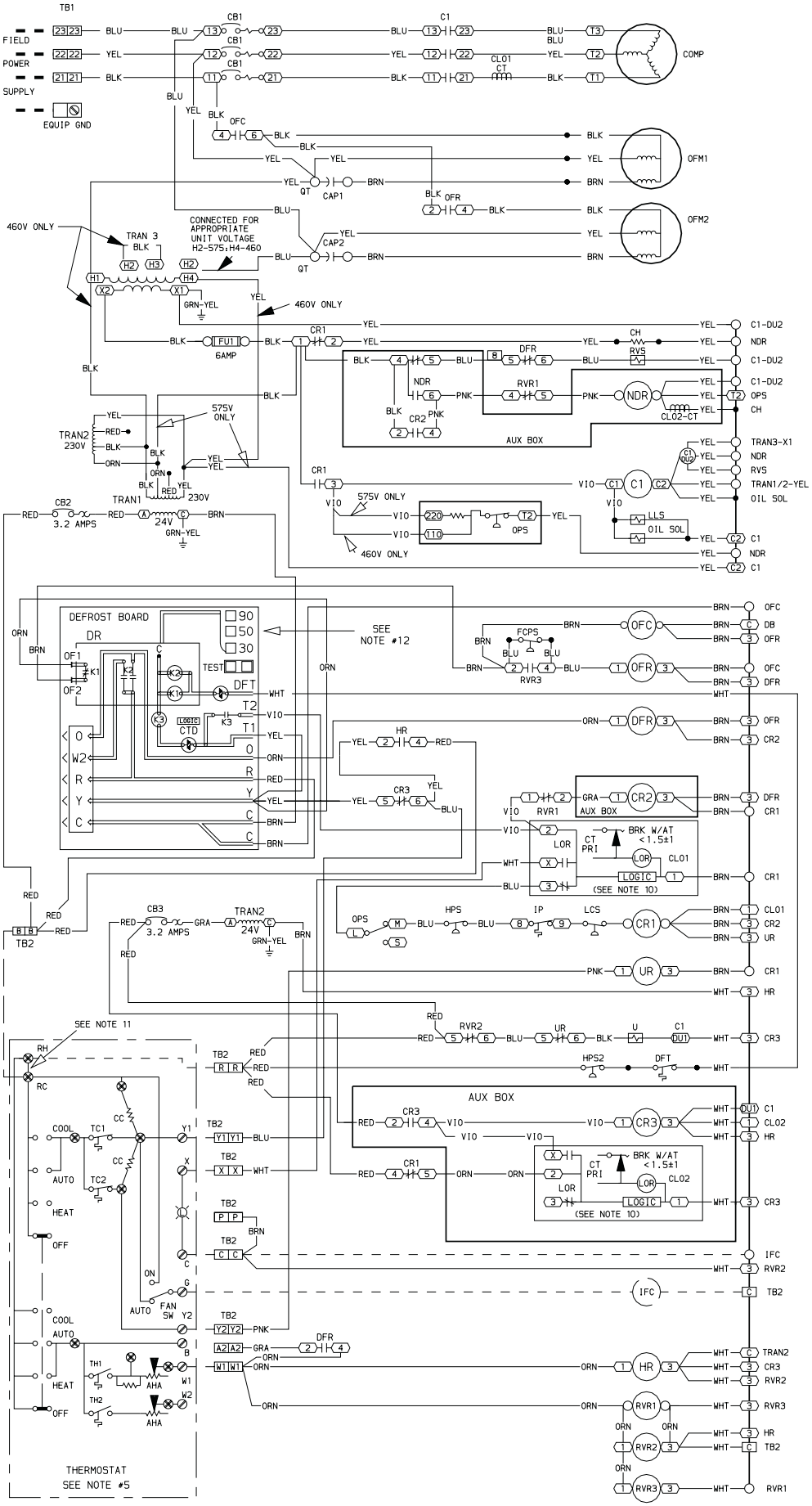


Fig. 3 — Schematic — 38AQS012,016; 460/3/60 and 575/3/60 Units

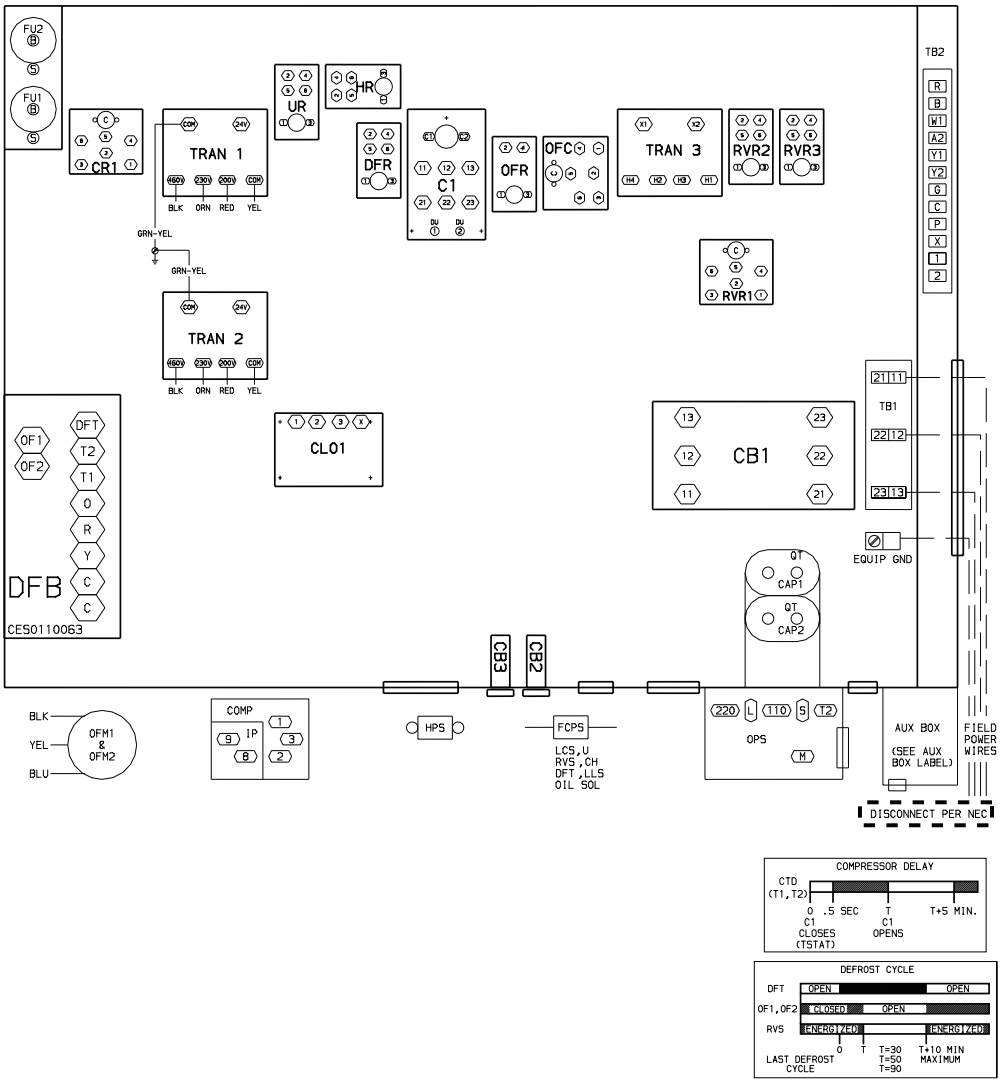


Fig. 4 — Component Arrangement — 38AQS012,016; 460/3/60 and 575/3/60 Units

MOTORMASTER® CONTROL (LOW AMBIENT KIT) INSTALLATION

The accessory low-ambient kit contains a fan speed (Motormaster) control device activated by a temperature sensor (Fig. 5). The kit controls condenser fan motor speed in response to the saturated condensing temperature. For outdoor temperatures down to –20 F (–29 C), it maintains the condensing temperature at 100 ± 10 F (38 ± 6 C).

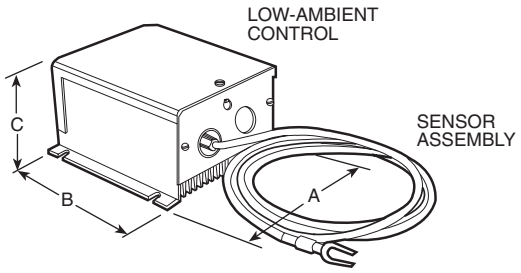
The low-ambient (Motormaster) control consists of a solid-state circuit on a printed circuit board encased in an aluminum extrusion. The control must be fastened to a panel in the unit, and the sensor assembly (Fig. 5) mounted to a return bend on the unit's condenser coil. Parts necessary for mounting control and sensor are included in the kit.

Pre-Installation

DISCONNECT UNIT POWER — To prevent electric shock, open and tag all disconnects before modifying the condensing unit.

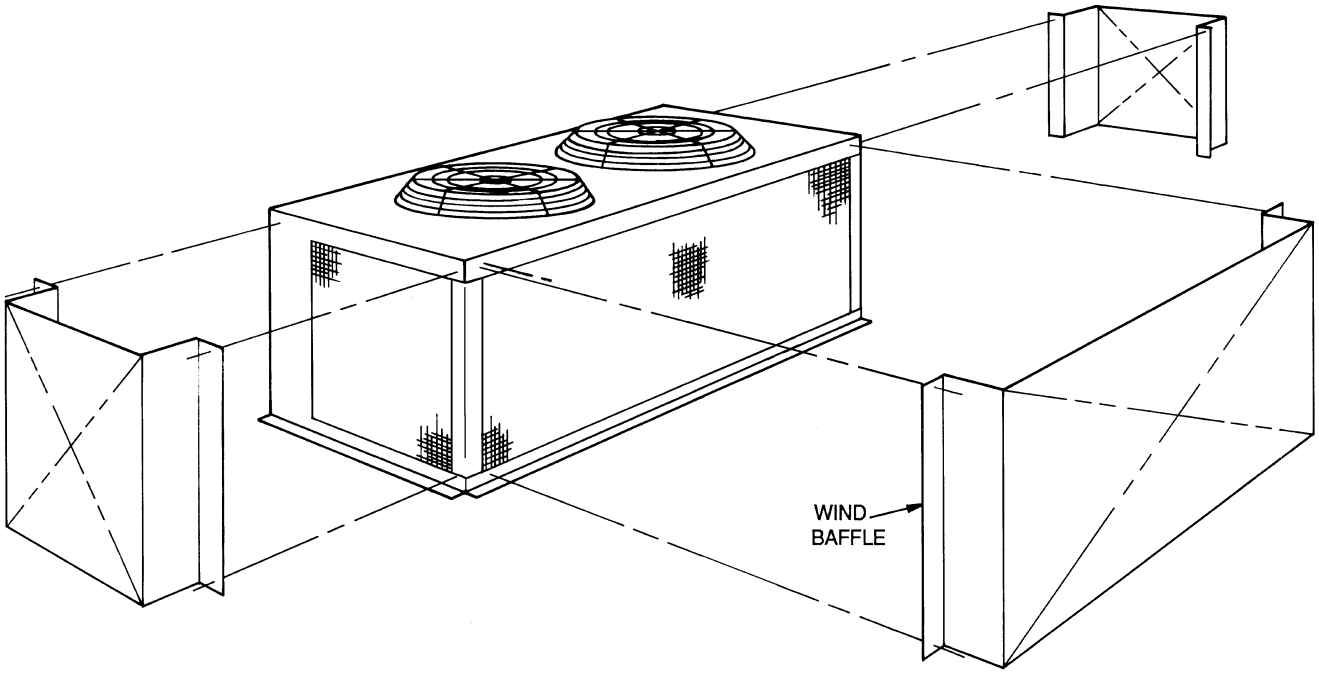
FABRICATE AND INSTALL WIND BAFFLES — The 38AQS units equipped with the low-ambient kit require baffles to prevent wind crosscurrents from causing abnormal operation as the fan is modulated. Construct and install wind baffles. See Fig. 6.

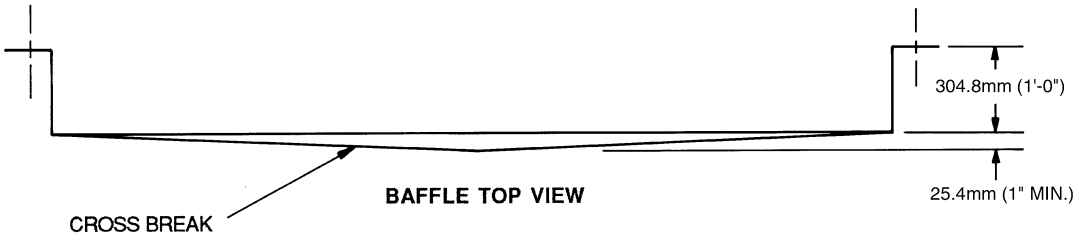
VERIFY POWER WIRING — Power wiring must comply with NEC (National Electrical Code) and all requirements. Confirm that supply voltage meets minimum voltage specified on the unit's rating plate and that it matches the voltage rating of the low-ambient kit.

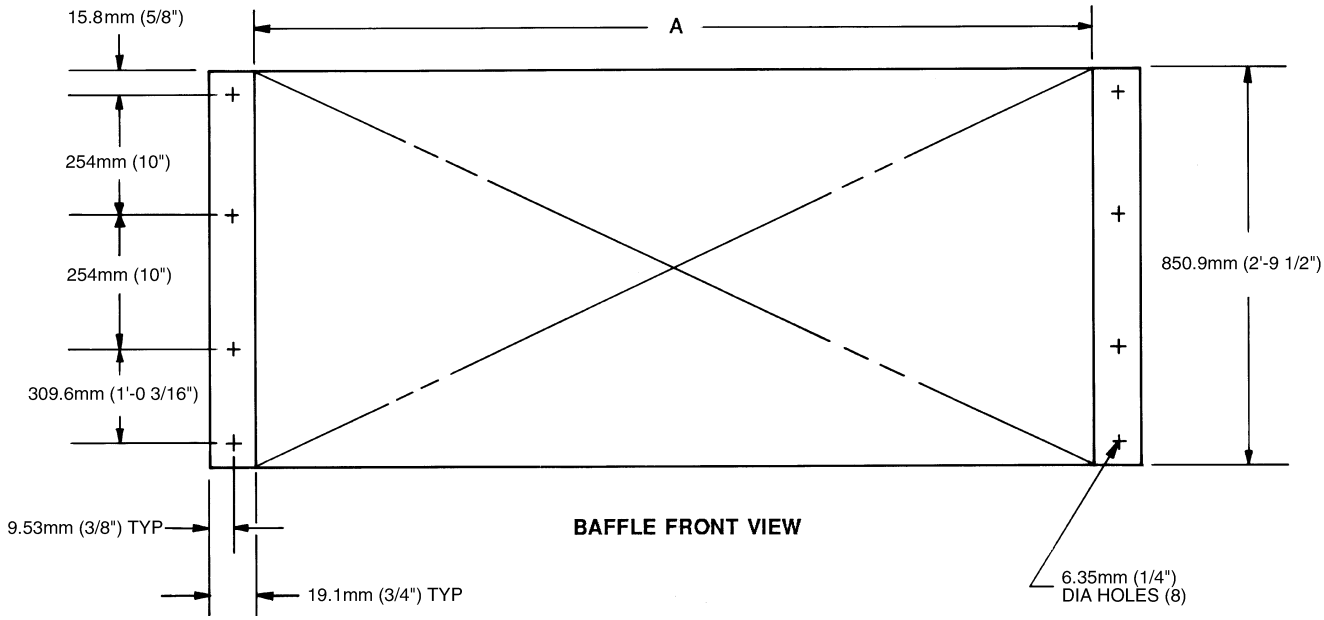


KIT NO.	VOLTS	AMPS	A	B	C
32LT900301	All except 460	8.0	$5^{7}/_{8}$	$6^{3}/_{16}$	$3^{3}/_{8}$
32LT900611	460	4.0	$5^{7}/_{8}$	$7^{3}/_{8}$	$3^{3}/_{8}$

Fig. 5 — Low-Ambient (Motormaster) Control and Sensor Assembly







DIMENSIONS (ft-in.)

BAFFLE LOCATION	A
Right-Hand Side*	2-5 11/16 (754.3 mm)
Back	5-8 1/8 (1730.3 mm)
Left-Hand Side*	3-0 7/16 (925.6 mm)

*As viewed from access panel side.

Fig. 6 — Wind Baffle Details

Installation — After completing the pre-installation steps, proceed as follows:

MOUNT CONTROL ASSEMBLY

1. See Fig. 7 for the location of the access panel and Motormaster® low-ambient control in the bottom of the unit. Remove the access panel.
2. Using the template supplied in this document, drill pilot holes for mounting the low-ambient control.

⚠ CAUTION

When drilling holes, be careful not to damage return coil bends inside unit.

3. Fasten control to unit with four no. 10 sheet metal screws and star lockwashers provided. Lockwashers are required to ensure electrical ground with condensing unit.

MOUNT SENSOR ASSEMBLY

⚠ CAUTION

The sensor assembly is fragile. Handle with care.

1. See Fig. 8 to determine where to locate sensor on coil return bend. As shown in Fig. 9, fasten sensor to return bend with the supplied screw, plate washers, and nut. See Table 1 for sensor temperature vs resistance values.

Table 1 — Sensor (Thermistor) Temperature vs Resistance

TEMPERATURE		NOMINAL RESISTANCE (Ohms)
F	C	
60	16	7750
70	21	5900
77	25	5000
80	27	4650
90	32	3650
100	38	2875
110	43	2275
120	49	1850

2. Coil and secure excess wire inside the unit near the sensor or next to the low ambient control; provide additional protection against abrasion or movement of the wire if necessary.
3. Reinstall the access panel.

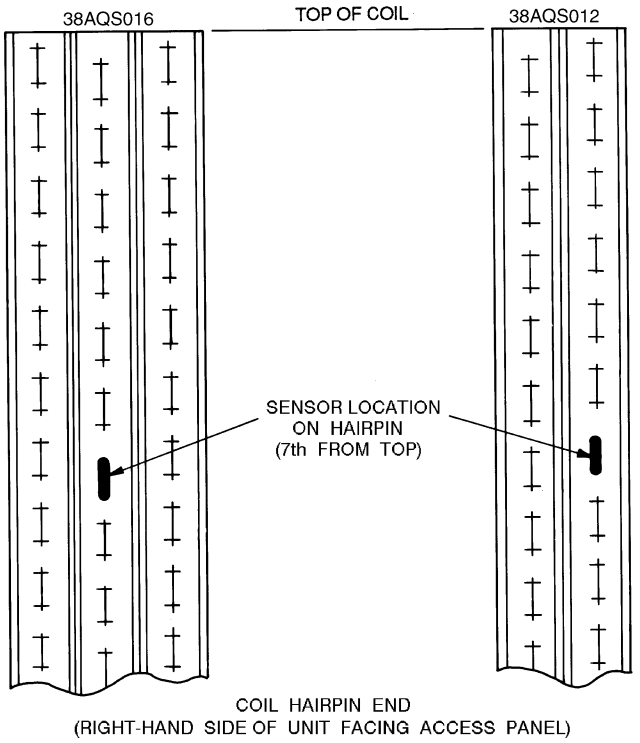


Fig. 8 — Motormaster® Sensor Location — 38AQS012,016

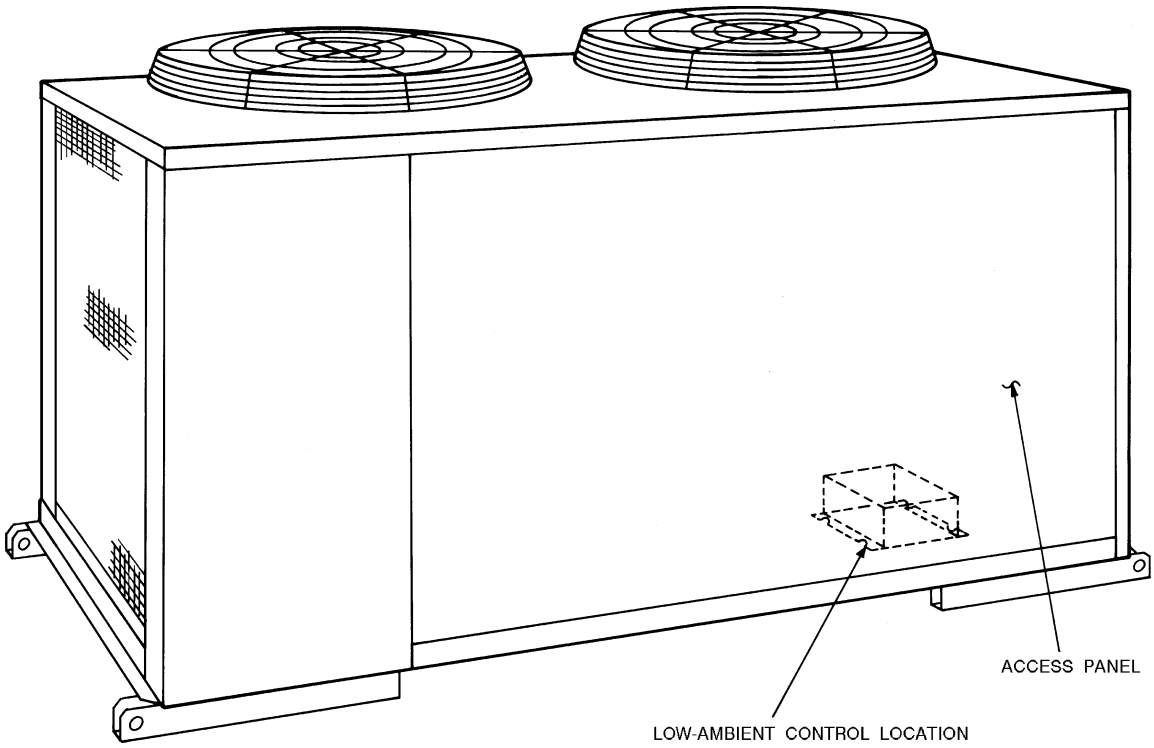


Fig. 7 — Motormaster Control Location

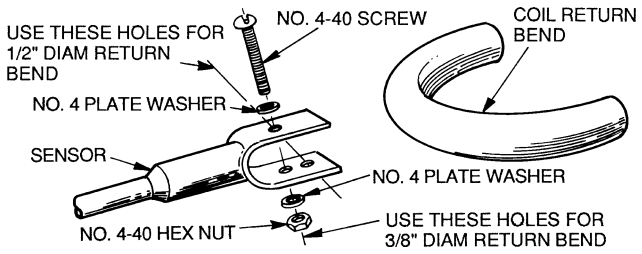

USE THESE HOLES FOR 1/2" DIAM RETURN BEND
NO. 4-40 SCREW
COIL RETURN BEND
NO. 4 PLATE WASHER
SENSOR
NO. 4 PLATE WASHER
NO. 4-40 HEX NUT
USE THESE HOLES FOR 3/8" DIAM RETURN BEND

Fig. 9 — Sensor Installation

INSTALL CONTROL POWER WIRING — Wire the Motormaster® low-ambient control to the unit's power circuit as shown in Fig. 10 and 11; refer to the following sections for various unit voltages.

Install the isolation relay coil in parallel with the reversing valve relay coil. This takes the Motormaster control out of the condenser fan motor circuit when the 38AQS switches to the heating cycle. (See Fig. 12.)

IMPORTANT: Wire low-ambient control in series with fan motor.

Power wiring must comply with all local and national requirements. All units except 460-v, 3-ph, 60-Hz use Motormaster control, Carrier Part No. 32LT900301. The 460-v units use Motormaster control, Carrier Part No. 32LT900611.

ALL UNITS EXCEPT 575-3-60 — For these units, without special transformer, wire Motormaster control to condenser fan motor circuit as shown in Fig. 10.

575-3-60 UNITS — The 575-v units require a special field-installed transformer and fan motor. Wire special transformer (part no. HT01AH859) and Motormaster control to special fan motor (part no. HC44VL852) as shown in Fig. 11.

Blue wire from CB1-13 to CAP1 must be reconnected from CB1-13 to TRAN2-H2.

Blue wire from CAP1 to TRAN2-H2 must be reconnected from CAP1 to field-installed transformer.

VERIFY OPERATION — Turn on the unit power and set the thermostat below the ambient room temperature. If the unit is equipped with a Time Guard® II circuit, wait at least 5 minutes.

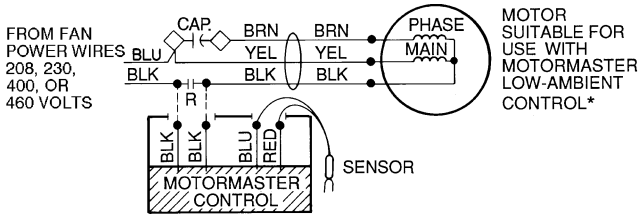
After the compressor starts, the fan speed is modulated according to the condensing temperature and then maintained until the set point is achieved.

If fan motor no. 1 does not start, verify the following conditions and correct as necessary:

- Condensing unit power is on.
- Power is present at fan motor relay contacts (or transformer output when one is installed).
- Sensor wire connections inside the low-ambient control are tight.

If the preceding conditions are met and fan motor no. 1 still does not start, perform corrective procedures or replace components as follows:

- Jumper the power wires (BLK-to-BLK) in the Motormaster control. If the motor does not run, check motor wiring and run capacitor. Replace capacitor and motor if necessary. If the motor runs, ensure the fan motor is wired in series with the control. Refer to Fig. 10.
- If the fan motor runs when connected to the single-phase voltage supply but does not run when connected in series with the Motormaster control, AND the return bend where the sensor is mounted is warm, short the sensor leads (BLU-to-RED). If the motor runs, replace the sensor. If the motor does not run, replace the control and sensor assembly.



*Use control part no. 32LT900301 for all unit voltages except 460 v. Use control part no. 32LT900611 for 460-v units.

Fig. 10 — Motormaster Control Power Wiring for All Units except 575-V

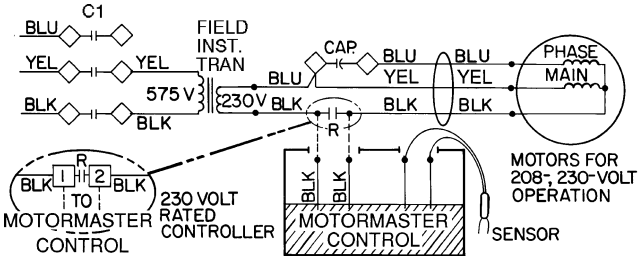
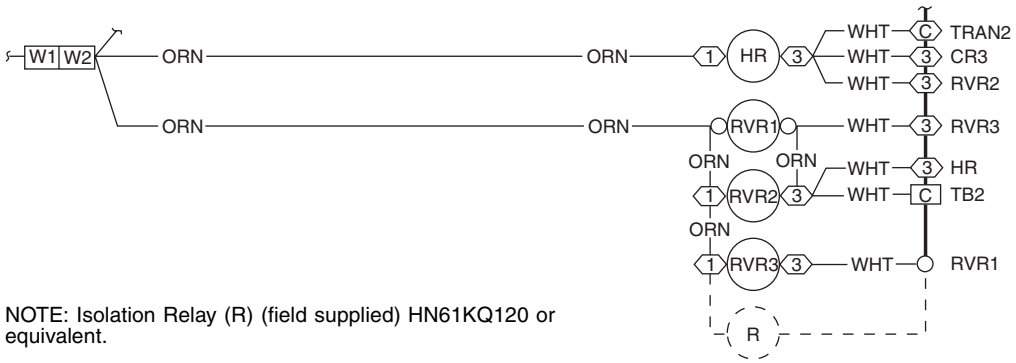


Fig. 11 — Motormaster Control Power Wiring for 575-V Units Using 208/230-V Motors



NOTE: Isolation Relay (R) (field supplied) HN61KQ120 or equivalent.

Fig. 12 — Motormaster Control Circuit Wiring with Isolation Relay

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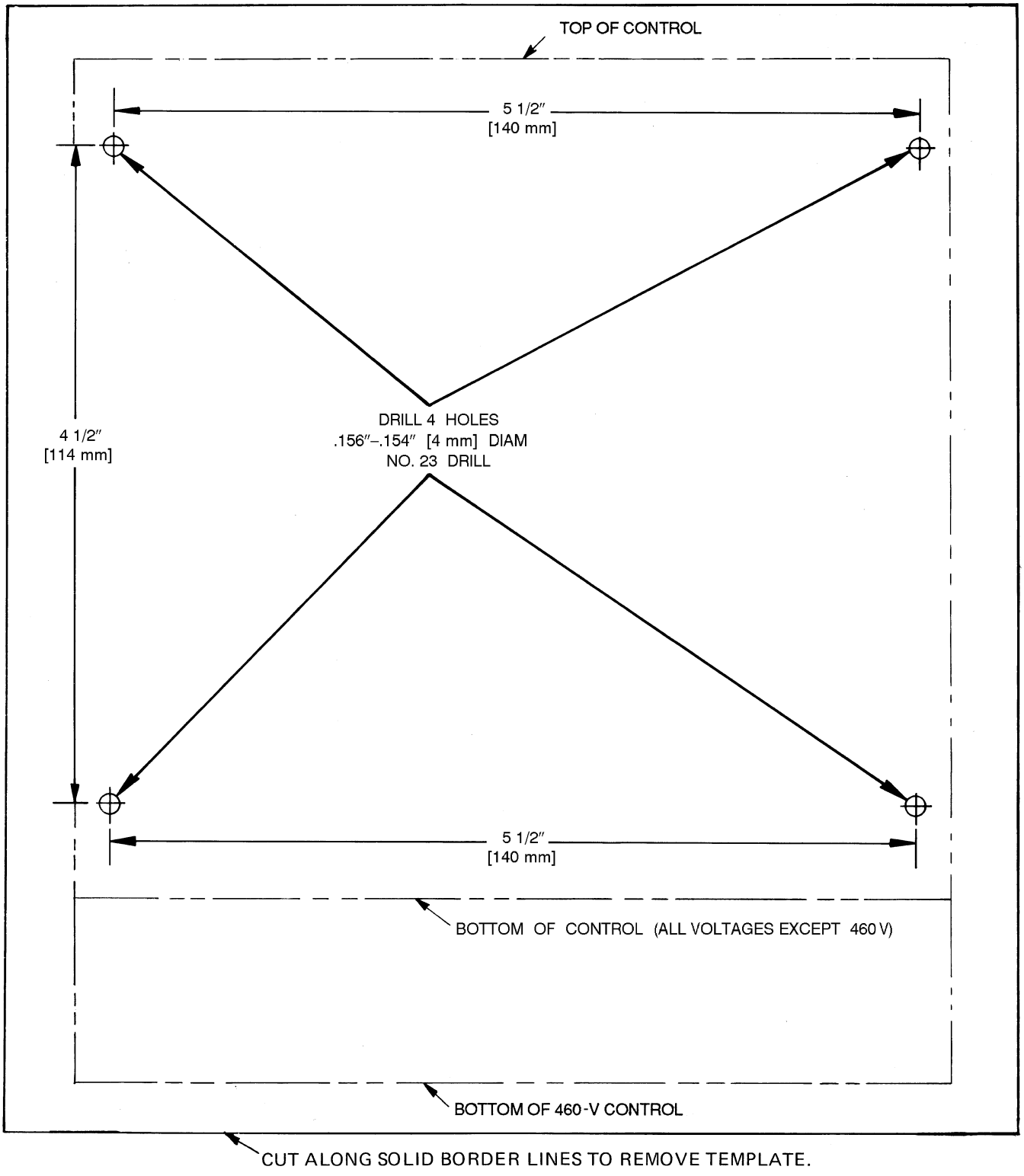
MOTORMASTER® CONTROL TEMPLATE



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Book	1	4	PC 111	Catalog No. 533-80074	Printed in U.S.A.	Form 38AQS-2W	Pg 12	11-02	Replaces: 38AQS-1W
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